HPCC Year Two Progress Report
"A Distributed, Real-time Hurricane Wind Analysis System"
Hurricane Research Division NOAA/AOML, Miami, FL

The following is a progress report for the second year of a three year project entitled "A Distributed, Real-time Hurricane Wind Analysis System". The second year of this project has been funded by NOAA's High Performance Computing and Communications Program, with Matching funds provided through the FEMA-NIBS HAZUS Project.

Updated* Milestones and Deliverables

1. **10-01-99**
Completion of scripts for automated data transfer from space-, aircraft-, ocean-, and land-based observing systems using Local Data Manager (LDM).
2. **07-15-99**
Prototype database schema design and evaluation versions of the database.
3. **10-01-99**
Continue development of graphical, interactive, workstation/web version of analysis software (H*WIND). Provide software components to NHC for development of operational automated (non-interactive) version of analysis.
4. **01-01-00**
Design of forecast and Emergency Management (EM) products from automated version of analysis.
5. **03-01-00**
Design of emergency management and scientific products.
6. **Summer-99**
Evaluation Workstation/Web (interactive) versions of analysis at NHC, AOML.

* The project commenced when the HPCC funds were received in February 1998.

Progress Report

1. Completion of scripts for automated data transfer from space-, aircraft-, ocean-, and land-based observing systems using Local Data Manager (LDM).

Documentation:

As of July, 1999, the following data are available to the system via LDM and our decoders: CMAN stations, buoys, ships, METAR data, GPS drops and Vortex messages. Most of the other data types that we need are already available through the LDM system, and decoders and scripts have been written for most them. We have also reused the hrd java packages to meet some of our decoding and adjustment needs, thereby minimizing bugs and testing time.

2. Prototype database schema design and evaluation versions of the database.

Documentation:

Work is complete on a database schema under an Oracle 8 Object Relational DBMS. The schema is based on the Masters Thesis* of the project's database administrator and database developer. We are currently using the database schema for preliminary testing and evaluation of the new wind analysis system.

*Morisseau-Leroy, N., Atmospheric Observations, Analyses, and The World Wide Web Using a Semantic Database, Master Thesis, School of Computer Sciences, Florida International University, Miami, FL, 1997

3. Continue development of graphical, interactive, workstation/web version of analysis software (H*WIND). Provide software components to NHC for development of operational automated (non-interactive) version of analysis.

Documentation:

Development for both the QCClient and Analysis Automation subsystems of the new system is ongoing and progressing steadily and is undergoing interactive Quality Assurance testing. In general, all code is up to date with latest jdk release (java 2) and implementation of most functionality is complete including database integration.

Most of the client application sub project and analysis sub project functionality requirements have been met. Some of the requirements for the QCClient application include: 1) map loading and drawing, 2) plotting of wind observations and storm track fixes in both synoptic and storm relative coordinates, 3) graphical tools such as zooming, observation flagging (quality control), distance/heading calculation and detailed observation inspection and editing, 4) separate "views" panel for immediate graphical response to any changes to data, and 5) file import and export capabilities for legacy data files, landmarks files, and GIS files.

We have developed a generic set of Java packages (groups of compiled classes) to promote code reuse among all Java implementations by our development team. Code reuse is important for testing, minimizing errors, saving space and saving time. The current upper level packages include "hrd.geography" (classes representing geographical objects such as global positions, global areas, maps, gis files, etc...), "hrd.meteorology" (classes representing meteorological objects such as wind observations, storm track fixes, storm tracks, sets of data, etc...), "hrd.math" (classes representing mathematical objects such as vectors, matrices and angles), "hrd.apps" (classes and subpackages pertaining to applications and the various subsystems of the project), "hrd.db" (classes and interfaces pertaining to general database connectivity), the utility packages "hrd.util" (non-graphical utilities) and "hrd.awt" (abstract-windowing-toolkit [graphical] utilities) and others. These code components can also

be used to create a non-interactive version of the analysis system along with many other applications.

The QCClient is part of the Masters Thesis** of the project's main application developer.

**Amat, Jr., L. R., A Realtime Internet Based Quality Control Application for Hurricane Surface Wind Observations, Master Thesis, School of Computer Sciences, Florida International University, Miami, FL, 1998.

4. Design of forecast and Emergency Management (EM) products from automated version of analysis.

Documentation:

In accordance with FEMA's requests, we have started work on creating GIS readable file versions of HRD's products. We currently have ways to read and create arbitrary "shapefiles" (an Arc View file format) in C and C++ as well as ways to read and display shapefiles in JAVA. Our work on shapefile generation is not complete, but we should have working tools by the end of the year. Many freely available tools exist for manipulating, viewing and translating shapefiles, so a user may use such a tool to create a file readable by another GIS, for example. An automated version of the analysis is near completion.

5. Design of emergency management and scientific products.

Documentation:

Work on product generation routines will be completed in concert with the demand for new products. We have completed development on the subset of routines that represents the products that HRD had available in realtime in previous years. All the routines are now implemented in Research Systems' (RSI) Interactive Data Language (IDL). The routines are capable of plotting images to a local screen and/or generating images in a variety of file formats for delivery as hard copies. We are investigating different methods of delivering dynamically generated IDL products over the web. Both CGI and Java based methods are possible, but software licensing, product delivery speed and the intricacy of the code are still issues to be resolved for each proposed method.

6. Evaluation Workstation/Web (interactive) versions of analysis at NHC, AOML

Documentation:

This milestone combines a great deal of work contained within other milestones, and , therefore requires that most of those milestones be met. In light of this fact, it is difficult to estimate whether or not this milestone needs to be adjusted. As it is now, testing an interactive version of the H*WIND system during the 1999 atlantic hurricane season seems feasible.

Conferences and Papers

Budget